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THE EDIBLE OIL MILLING SECTOR IN MYANMAR'S DRY ZONE

By

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EXECUTIVE SUMMARY

This report presents findings from a survey of edible oil mills in Myanmar's Central Dry Zone, comprised of structured interviews with 144 mills in five urban centers, and 38 mills in rural areas of nine townships (total 182 mills). The following results stand out:

Groundnut is the most important crop processed by Dry Zone millers, milled by 94% and 87% of urban and rural mills, respectively. Sesame is of lesser importance for urban mills (milled by 31%), but is a major crop for rural mills (milled by 74%).

The domestic mill sector utilizes only a small share of Myanmar's total oilseed production. The majority of sesame produced in Myanmar is exported.

The quantity of oilseeds procured by urban mills fell by more than half from 2012 to 2017. The mean volume of groundnut procured fell 55%, from 509 t to 230 t, while the mean volume of sesame procured fell 53%, from 386 t to 182 t.

The mill sector is highly concentrated and concentration has intensified since 2012. Large mills procured around 90% of all groundnut and sesame milled by urban mills in 2017. The Gini coefficient of oilseed procurement rose from 0.63 in 2012 to 0.76 in 2017, indicating deepening market concentration.

Urban and rural mills have different business models. Urban mills earn income mainly by adding value to purchased oilseeds by processing them, whereas rural mills earn income mainly by providing custom milling services to oilseed farmers for a fee.

Most equipment owned by mills is old. The average age of most items of milling equipment owned by urban mills is 14-17 years.

Most oil produced in the Dry Zone is consumed locally. Sixty-nine percent of all oil produced by urban mills in the Dry Zone is sold locally. Local consumers account for 57% of sales. Local retailers are the second largest market segment (12% of sales).

More than half of urban mills brand the oil that they sell, and one third advertise their products. The number of mills that advertise has grown rapidly since 2011.

Oilcake is an important co-product that contributes mill income. Oilcake sales account for around 20% of the gross revenues earned by urban mills.

Mills have responded to demand for cheaper oil by selling blended oils. Many mills sell groundnut oil blended with palm oil to consumers more cheaply than pure groundnut oil. Palm oil accounted for 15% of the volume of reported oil sales by Dry Zone mills in 2017.

The real retail price of palm oil has halved since 2011, while the price of groundnut oil has remained stable. The long run decline in the price of palm oil corresponds with the removal of restrictions on imports in April 2011 that opened up the market to private importers.

Domestically milled oil cannot compete with imported palm oil on the basis of price. Processed palm oil is cheaper than un-milled groundnut, and groundnut oil sells for more than double the price of palm oil.

Myanmar's market for edible oil has become segmented. Retail prices for groundnut oil and palm oil have diverged to such an extent that locally sourced products cater to a relatively small group of better-off consumers who can afford domestically produced oil, and a large group of lower income consumers who cannot.

Better-off consumers are willing to pay a premium for niche high quality oil. Lack of confidence in the provenance of oil produced by conventional 'expeller' mills has created opportunities for a 'niche' oil with distinct sensory characteristics produced by small artisanal mills adapted from traditional designs. Oil from these mills attracts a price premium over oil produced by expeller mills.

Numbers of conventional oil mills fell 30% over the past decade, but the number of artisanal mills doubled. Numbers of urban 'expeller' mills dropped from 266 to 186, whereas the number of small artisanal urban mills producing premium oil jumped from 78 to 156, but artisanal mills account for only 2-3% of edible oil production.

Implications for policy and programming

These results paint a picture of Myanmar's edible oil milling industry attempting to adjust to the long-term challenge posed by liberalization of palm oil imports, and suggests a number of implications for policy and programming, as follows.

1. **Efforts to protect Myanmar's edible oil milling industry (e.g. by restricting palm oil imports or raising import duties) would hurt poorer consumers.** Although liberalization of palm oil imports has proven challenging for domestic millers, it enables consumers to access edible oil at affordable prices.

2. **Establishing a national quality assurance scheme for edible oil could give customers more confidence in the quality and provenance of the oil they buy**. However, costs of compliance should not represent a barrier to SMEs, and training and support would be needed to help to mills to upgrade practices to meet the standard.

3. **Support for improving branding and marketing strategies could help mills differentiate their products and target a larger customer base.** For example, by developing more effective online marketing campaigns and integration with emerging e-commerce platforms, or adopting geographical indications or regional brands (e.g. for Pakkoku *sone hsi* oil).

4. **Adoption of national standards combined with better marketing can provide a foundation for entry into export markets** with higher quality standards for the best performing mills, enabling more of the value added from the oilseed sector to be retained in Myanmar. Infrastructure such as laboratory testing facilities will be needed if Myanmar is to climb the value ladder.

Productivity increases in Dry Zone oilseed farming will increase farm incomes but are unlikely to improve the competitiveness of the milling sector relative to imported palm oil. Any oilseed surplus to domestic requirements is exported, dampening any effect that an increase in oilseed production by farms in Myanmar might have on domestic oil prices.

CONTENTS

1. INTRODUCTION

Groundnut and sesame are among Myanmar's most important agricultural crops. Myanmar is reported to be the world's 2nd largest producer of sesame and 7th largest producer of groundnut, with annual production totaling 0.76 million tons and 1.58 million tons, respectively (FAO, 2019)[1]. The Dry Zone in central Myanmar is regarded as the country's 'oil bowl'. However, Myanmar's edible oil milling sector is widely believed to be in crisis, as liberalization of oil palm imports, combined with the decreasing real price of palm oil on world markets, has left domestic millers struggling to compete (Htoon, 2018).

No comprehensive survey-based study has ever been conducted on the mill segment of the edible oil value chain in Myanmar. As a result, recent trends within the sector and their policy implications are poorly understood. This study addresses these information gaps through a survey of oil mills in some of the most important urban and rural locations for oil milling in the Dry Zone.

We present findings on the characteristics of the milling segment of Myanmar's edible oil value chain in Magway, Sagaing and Mandalay regions in the Dry Zone, based on a survey of 182 oil mills (144 urban, 38 rural) in five urban centers (Magway, Pakkoku, Monywa, Shwebo, and Mandalay) and rural areas of nine townships[2] (Table 1). Figure 1a shows the actual location of all surveyed mills, including mills with overlapping positions. Figure 1b depicts the same mills but with the locations dispersed so that all mills are fully visible.

All interviews were conducted in December 2017. Together, the enterprises interviewed accounted for 83% of known urban oil mills operating in the five selected urban areas at the time of the survey. The share of rural mills surveyed is not known due to the prohibitive cost of establishing a sample frame. Details of the sampling strategy are reported in the following section.

Table 1 Number of urban and rural oil mills surveyed, by region

	Magway	Mandalay	Sagaing	Total
Urban	75	51	18	144
Rural	16	5	17	38
Total	91	56	35	182

The rest of this report presents key results in three sections: (1) Survey methodology and sampling strategy. (2) Results, covering changes in the structure of the edible oil mill sector, the characteristics of oil milling enterprises, mill assets and equipment, oilseed procurement and processing, oil sales, and marketing. (3) The final section of the report summarizes key results and addresses their policy implications.

[1] These statistics should be treated with caution, as officially reported production data for other crops in Myanmar, including rice and fish, are known to be highly inflated.

[2] The townships of Magway, Natmauk and Pwintbyu in Magway district; Meiktilla and Wundwin in Mandalay district; and Budalin, Chaung U, Shwebo and Wetlet in Sagaing district.

Figure 1a. Actual mill locations

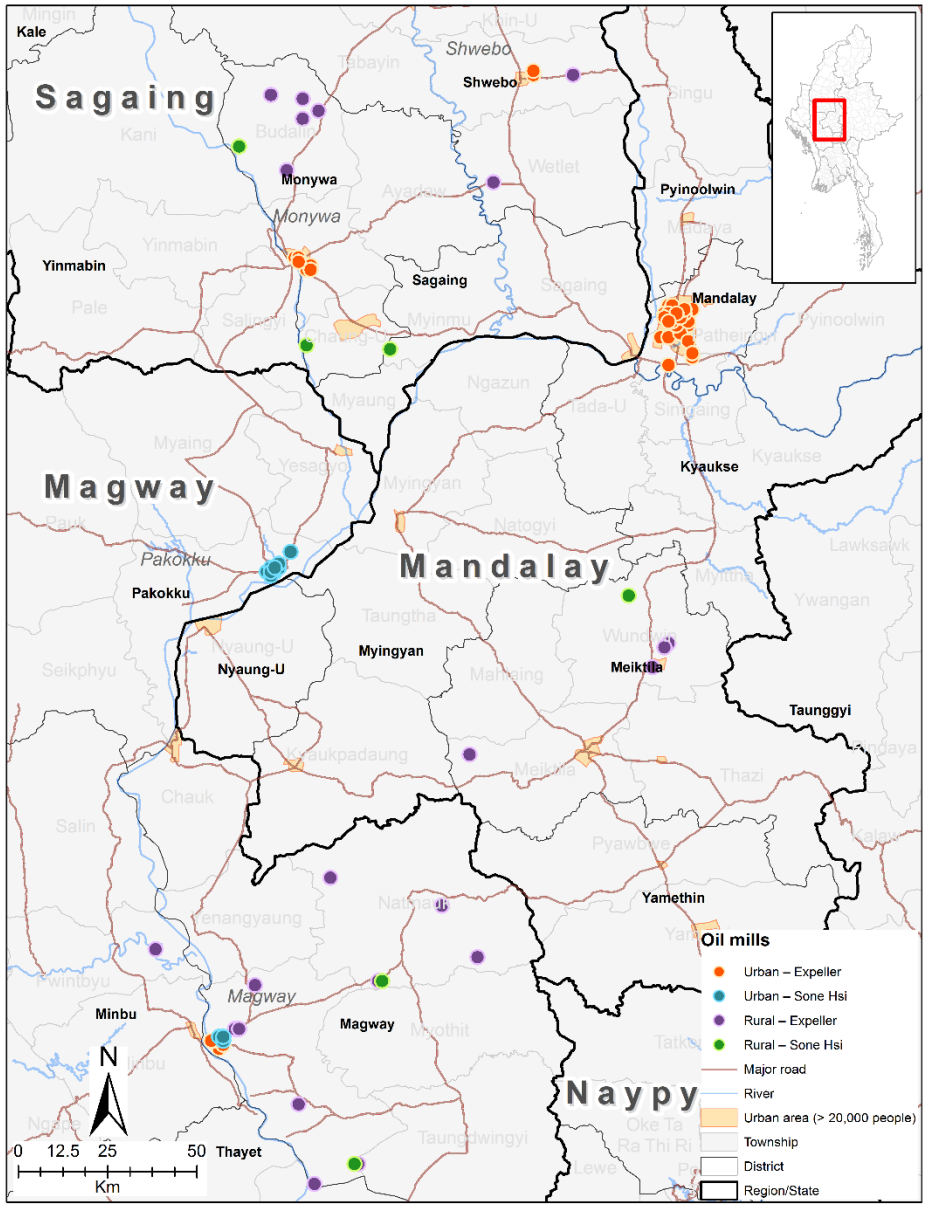
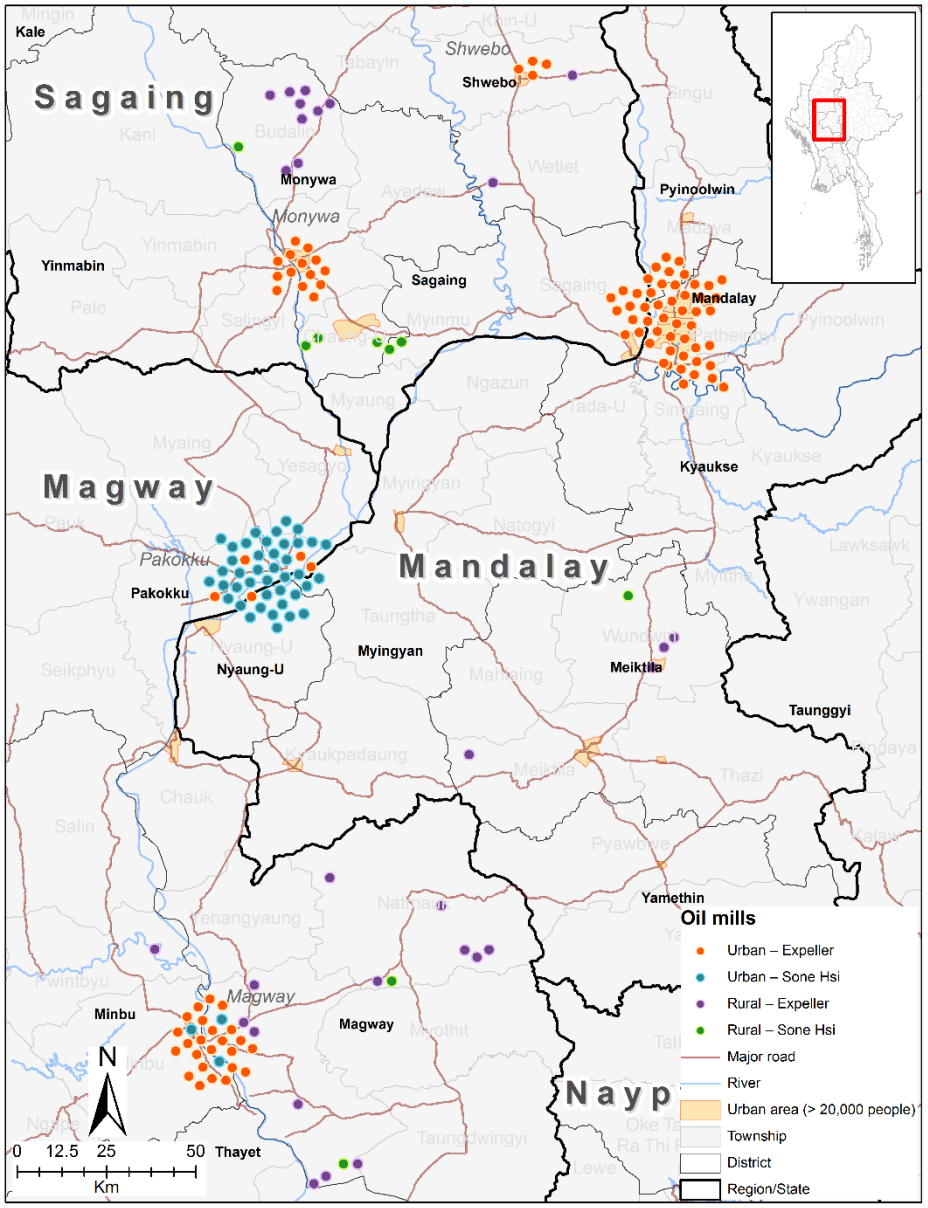


Figure 1b. Dispersed mill locations



2. SURVEY METHODOLOGY AND SAMPLING STRATEGY

This survey took place as part of a larger program of research on agricultural value chains in Myanmar's Dry Zone. This geographical focus defined the survey's scope. There are five agricultural Commodity Exchange Centers (CECs) in the Central Dry Zone. The CECs offer a space for buyers and sellers of pulses, oilseeds and other grains to meet, display their wares, interact and agree on transactions. All five CECs are located in urban areas (Mandalay in Mandalay region, Magway and Pakkoku in Magway region, and Monywa and Shwebo in Sagaing region).

According to our scoping interviews, any miller who wishes to source raw material from a CEC is required to register as member and pay an annual fee in order to use the center's facilities. The organizing committee of each CEC keeps a record of members, including business addresses and contact details. Two hundred and fifty-nine mills were identified from CEC membership lists in these locations, and by additional door-to-door searches in the same towns. During survey implementation, 59 listed mills were found to be inoperative, 27 were listed incorrectly, and 29 could not be contacted or declined to be interviewed. Most mills that declined an interview were small, but one was very large. A final sample of 144 mills were interviewed. This represented 83% of the known population of operational oil mills in the Dry Zone's major urban centers for milling. None of the mills interviewed was found to operate more than one branch.

Rural oil mills are typically smaller than urban mills, and are usually unregistered, making it necessary to adopt a different sampling strategy. A survey of Dry Zone agricultural machinery outsourcing service enterprises was conducted at the same time as the Dry Zone oil mill survey (Belton et al., 2018). Rural oil mills were selected for survey in the same villages where the machinery outsourcing services survey was implemented. Data collected during an earlier survey in May 2017 – the Rural Economy and Agriculture Dry Zone community survey (READZ) (Belton et al. 2017) – were used to obtain a list of machinery outsourcing businesses in 300 randomly selected villages in 14 townships in the Central Dry Zone. All villages with one or more combine harvesters or at least 3 four-wheel tractor were selected for inclusion in the Dry Zone agricultural machinery outsourcing service enterprises survey. All oil mills located in these villages were listed. A total of 38 rural mills were identified in this manner and included in the survey.

Thus, the urban oil mill data presented in this report is representative of all mills that consented to participate in the interview process, but rural oil mill data does not represent the entire population of rural Dry Zone oil mills, and should be considered indicative only. For this reason we analyze urban and rural oil mill data separately in the following report.

The survey was administered to millers individually at their business premises. The survey instrument was designed to elicit information on type and volume of oilseeds procured and milled, method of procurement, type of milling equipment utilized, and marketing channels and marketing strategies for milled oil. The questionnaire included recall questions designed to capture changes in value chain structure and actor behavior between the year of the survey (2017) and five years earlier (2012).

In addition, we make use of secondary data on edible oil prices, published by Myanmar's Central Statistical Office (CSO). CSO collects data on retail prices of a basket of consumer goods from markets across the country on a weekly basis, in order to construct the consumer price index (CPI)

used to measure inflation. Groundnut oil and palm oil are two of the items used to construct the CPI. We utilized this price data, along with the CPI itself, to produce a continuous time series of real (inflation adjusted) retail prices for groundnut and palm oil in Myanmar from 2008 to 2017.

We also utilize the datasets of the nationally representative Integrated Household Living Conditions Survey (IHLCA) 2010, and Myanmar Poverty and Living Conditions Survey (MPLCS) 2015 to obtain information on data on changes in edible oil consumption per capita over this five-year period.

3 RESULTS

3.1 Changes in sectoral structure

We categorize mills according to location, size and technology in our analysis. These categories are explained below prior to a discussion of results.

First, location is identified as urban or rural. Rural mills are typically smaller than urban mills (though small urban mills also exist), and they operate mainly on a rental basis for farmers (custom milling). As noted by Favre & Myint (2009), the main comparative advantage of these mills, given their small capacity, is that farmers can process small amounts of oil crops sufficient for their home consumption, or for sale as groceries in the village. Urban mills are larger on average than rural mills. Their business model is usually to buy oilseeds and sell milled oil and oilcake, and they do little custom milling.

Second, (among urban mills), by size tercile. Size terciles were obtained by ranking mills from smallest to largest based on total volume of raw material procured annually, and dividing into three groups of equal size. Tercile 1 is comprised of the third of mills that process the lowest volumes of raw material, and tercile 3 the largest). Tercile 1 can be considered analogous to 'small' mills, with tercile 2 as 'medium' and tercile 3 'large'.

Third, by technology, as: (1) 'expeller mills'; (2) '*sone hsi*' mills.

Expeller mills crush oilseeds using an encased rotating screw powered by an engine or motor. Expeller presses come in a wide range of sizes and designs. Rural mills often use small, Chinese-manufactured 'automatic' expeller presses that combine crushing and oil filtration functions. Larger expeller presses usually have separate oil settlement tank and filtration systems, and may be fed manually or by a conveyor belt (automatic feeder).

Sone hsi mills are the traditional design for Myanmar mills, and operate on the principle of a pestle rotating in a mortar. Oil is extracted in the mortar through friction caused by the revolving pestle (Favre & Myint, 2009). Traditional *sone hsi* mills are powered by draft animals driven in circles around the mill, but modified designs now make use of electric motors as their power source. All *sone hsi* mills that operate in urban areas are motorized. Figure 2a-d presents examples of some the types of milling equipment used.

Figure 2a. Rural mill with combined expeller press and filter

Figure 2b. Small urban 'sone hsi' mill (motorized)

Figure 2c. Large urban mill with expeller press

Figure 2d. Large urban mill with expeller press and automatic feeder

We asked all surveyed milling enterprises to estimate the number of expeller and *sone hsi* mills operating in their township (urban mills) or village tract (rural mills) in 2017, 2012, and 2007. Results are presented in Figure 3a & b.

Figure 3a & b Numbers of expeller and *sone hsi* mills operating in surveyed towns/cities (urban mills) and village tracts (rural mills) in 2017, 2012 and 2007.

Figure 3a: Urban

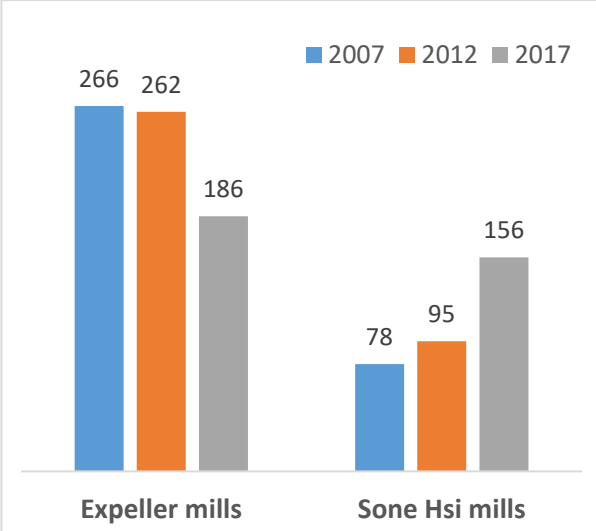
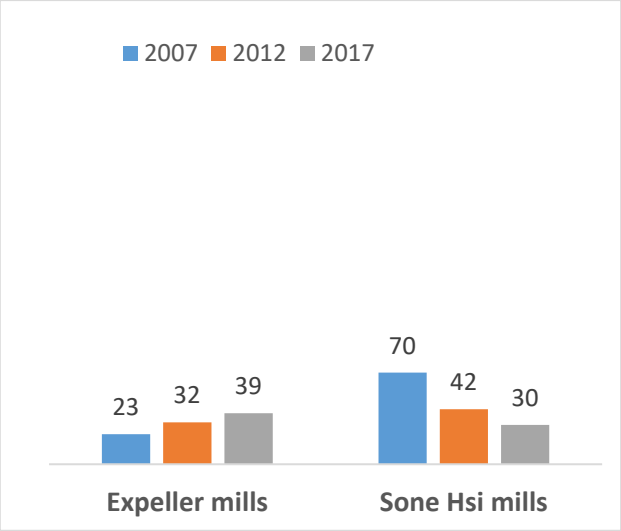


Figure 3b: Rural



Over the past decade, urban expeller mill numbers declined sharply, but the number of artisanal *sone hsi* mills doubled. Eighty mills closed between 2007 and 2017, causing the number of operational expeller mills in the five urban areas surveyed to drop by 30%, from 266 to 186. In contrast, the number of urban *sone hsi* mills doubled, from 78 to 156. *Sone hsi* mills account for the majority of small mills (67% of urban tercile 1 mills) and one quarter of midsize mills (24% of tercile 2), and were established 6-7 years more recently than urban expeller mills on average. However, despite being quite numerous, urban *sone hsi* mills account for approximately 2-3% of oil produced in the Dry Zone. Nearly all are found in the town of Pakkoku (see Figure 1b). This pattern can be explained as follows. Many urban expeller mills closed from 2007 to 2017 as imports of cheap imported palm oil displaced consumer demand for groundnut and sesame oil. According to our interviews with millers, oil produced in *sone hsi* mills has an easily recognizable cloudy appearance that is different to that of oil produced by expeller mills. This characteristic provides buyers with the assurance *sone hsi* oil has not been blended with palm oil (believed to be a common practice), and earns a price premium. Because of its high price, oil from urban *sone hsi* mills is marketed mainly to middle-class consumers, who represent a small but growing market segment.

Rural expeller mills have replaced traditional *sone hsi* mills. The number of rural expeller mills operating in surveyed village tracts grew 70% (from 23 to 39) over the period 2007-2012, while the number of *sone hsi* mills fell by 57%, from 70 to 30, with the total number of mills falling from 93 to 69. As detailed in Section 3.4 below, rural mills earn income mainly by charging fees from local farmers

who wish to mill oil for home consumption. Small low-cost Chinese-made 'automatic' expeller mills, usually powered by diesel engines, have become increasing available in recent years. They process oil more quickly and cost-effectively than traditional draft-powered *sone hsi* mills, and have gradually come to replace them (c.f. Favre & Myint, 2009). Limited demand among rural consumers for premium priced *sone hsi* oil may account for the lack of growth of motorized *sone hsi* mills in rural areas, as compared to urban.

3.2 The characteristics of oil milling enterprises

The typical mill owner is an educated middle-aged man. Eighty-five percent of mill owners were reported to be men, with an average age of 52. Urban millers are very highly educated by Myanmar standards, with 72% having been educated to upper secondary level or above (19% had completed upper secondary school and 53% had received higher education). This demographic profile is similar that of pulse and oilseed traders in the Dry Zone, as reported by Belton and Mather (2019). Rural millers are rather less educated than their urban counterparts (22% educated to upper secondary level and above), but still ahead of the rural average.

Most urban mills are formal businesses. Ninety-two percent of urban businesses have names, as compared to 32% of rural mills.

One quarter of urban mills are located in an industrial zone. These zones are located on the outskirts of several urban areas in the Dry Zone and have access to relatively uninterrupted supplies of mains electricity. Most mills that reported having relocated in the past did so in order to move to an industrial zone, but there was no clear pattern in the timing of these relocations, suggesting that they did not occur as a direct response to any specific national industrial policy.

Two thirds of urban mills are partially vertically integrated. Around one third of urban milling businesses trade oil seeds (32%) or operate oil retailing businesses (36%), and one quarter (24%) work as edible oil wholesalers (Table 1). Fifteen percent are involved in the trading or processing of non-oil crops, but only 5% or urban millers are engaged in crop farming themselves. As expected, larger mills are most likely to trade oilseeds or edible oil, and small urban milling businesses are more likely to operate oil retailing businesses. Twenty percent of urban mills integrate both wholesale and retail functions (slightly more common among large mills), but only 3% integrate all mid- and downstream functions in the edible oil value chain (i.e. oilseed trading + milling + oil trading + oil retailing).

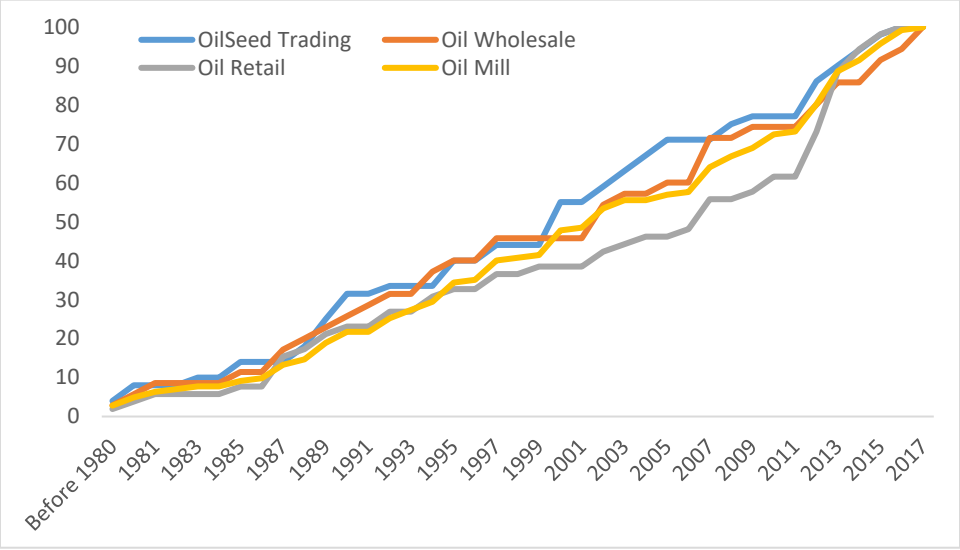
Rural mills are mainly operated by farm households. Vertical integration is much more limited among rural mills (16% of enterprises) than among urban mills (65%). Twenty-one percent operate as oil retailers, but only 5% trade edible oil and none trade oil seeds (Table 1). However, the vast majority 79% are involved in crop farming. Eleven percent operate agricultural machinery or transport rental businesses, as compared to just 1% of urban mills. Urban and rural millers operate other non-farm businesses and engage in professional or salaried work in similar proportions (24%, and 13-15%, respectively). The activity portfolios of urban and rural millers reflect differences in socio-economic origin, scale of operation and geographical advantage. Larger urban millers are primarily entrepreneurs, have sufficient capital and buying power to invest in upstream and downstream activities, and are strategically placed geographically to interact with large numbers of buyers and sellers. In contrast, rural millers originate mainly from farm households and practice milling mainly as form of income diversification.

Table 1 Businesses and income generating activities practiced by urban and rural mill households

Other source of income	Urban	Rural
Oil retail	36	21
Oilseed trading	32	0
Oil wholesale	24	5
Other crop trading or processing	15	3
Crop farming	5	79
Rental service provision	1	11
Other non-farm business	24	24
Professional/salaried work	15	13
Others	15	14
Any, excluding paid work	82	89

Urban oil mills were established at a steady rate over the period 1980-2017. One-third (34%) were established within the past decade. The oil trading businesses owned by urban millers were established slightly earlier on average than oil mills, suggesting that trading can serve as a point of entry into the milling business. Oil retailing businesses operated by millers tended to be established somewhat later than mills, perhaps as part of attempts to diversify income streams in the face of falling returns from milling following the liberalization of palm oil imports in 2011 (Figure 4).

Figure 4: Cumulative share of oil mills, oilseed trading businesses, oil trading businesses, and oil retail businesses established by surveyed milling enterprises, by year (pre-1980-2017).



Most urban mills employ fulltime workers. Eighty-three percent of urban oil mills employ workers, and three-quarters (76%) employ fulltime staff. Rural mills are much less likely than urban mills to hire labor (29% employ workers, and 18% employ fulltime staff).

3.3 Mill assets and equipment

Urban mills utilize a larger variety of equipment than rural mills. This is to be expected, given the larger average size of urban mills. Approximately one-half of urban mills have oil settlement tanks and overhead oil tanks (for storing oil), as compared to 3-6% of rural mills (Table 2). Urban mills are also more likely than rural mills to own sesame cleaning machines, groundnut screeners, and boilers (used to produce steam to heat seeds to increase oil yield), suggesting that they place more emphasis on producing high quality product. Urban mills are also more likely to own power meters, transformers and motors than rural mills, whereas rural mills are more likely to own generators, suggesting the former have better access to electricity (a finding confirmed by our qualitative interviews). Rural mills are more likely than urban to own groundnut shellers (used for shelling groundnuts. It is likely that rural mills owning groundnut shellers offer this service to their customers, whereas urban mills mainly buy groundnuts shell-off, direct from traders. None of the mills surveyed produce oil by solvent extraction.

Most equipment owned by urban mills is old. The average age of most items of milling equipment is 14-17 years. Motorized *sone hsi* oil presses are newer, averaging 8 years old, pointing to the relatively recent emergence of this technology in the urban milling sector of the market. Equipment owned by rural mills is slightly newer than that used by urban mills, with most items having an average age of 6-12 years. This is indicative of the relatively recent spread of rural expeller mills, reflecting the growing availability of cheap imported Chinese machinery. The vast majority of equipment owned by both urban and rural mills was purchased (i.e. there is very little hiring of mill equipment).

Table 2: Equipment owned by urban and rural mills (% of mills)

Equipment	Urban	Rural
Groundnut sheller	17	26
Groundnut screener	8	0
Sesame cleaning machine	32	6
Sesame color sorter	0	0
Automatic expeller press	13	18
Expeller press	44	47
Expeller press with boiler	15	3
Traditional *sone hsi* mill	0	6
Motorized *sone hsi* mill	31	26
Automated feeder	4	0
Oil settlement tank	59	6
Oil filter	56	24
Overhead oil tank	47	3
Boiler	9	6
Motor	76	3
Generator	13	29
Electrical transformer	10	3
Power meter	58	9

Urban mills own more powerful milling equipment than rural mills. Urban mills own and operate between one and two of each item of equipment on average, whereas rural mills own a single

piece, reflecting the larger scale of operation of urban mills. With the exception of urban tercile 1 mills, the milling equipment owned by urban mills is more powerful than that owned by rural mills (Table 3). Oil presses belonging to urban mills have an average power rating approximately double that those owned by rural mills (48hp vs 26 hp). The average combined power rating of oil presses belonging to urban mills in terciles 1-3 is 15, 47, and 68 hp, respectively. This corresponds well with Favre & Myint's (2009) definition of small, medium and large mills in Myanmar (<25 hp, 25-50 hp, and >50 hp, respectively).

Table 3: Average number and power rating of milling equipment owned, by mill type

Item	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)	All (rural)
Mean power rating of all oil presses (hp)	15.1	47.4	68.4	47.7	25.9

Capital investments in milling equipment are substantial. The mean value of milling equipment owned by urban mills (adjusted to 2017 prices) is MMK 31.7 million (roughly $23,500 at 2017 exchange rates[3]). This is five times higher than the mean value of milling equipment owned by rural mills (MMK 3.0 million, $3700). The mean value of mill equipment owned by urban tercile 3 mills is 14.5 times higher than the value of equipment owned by urban tercile 1 mills, reflecting differences in the capacity and technical sophistication of machinery owned (Table 4). The majority of tercile 1 mills use simple locally manufactured *sone hsi* presses.

Table 4: Value of milling assets owned, by mill type (constant 2017 prices)

	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)	All (rural)
Mean (MMK)	4,004,188	35,900,000	58,200,000	31,700,000	5,044,350
Median (MMK)	1,190,145	12,800,000	23,800,000	6,021,728	2,996,553

The most expensive items of equipment owned by urban mills are electrical transformers (installed to facilitate access to the electrical grid), with a mean cost of MMK 26.9 million ($20,000). This underlines the high cost to businesses of a lack of public electricity connections. Automatic expeller presses and standalone expeller presses (MMK 17.8-15.1 million; $11,000-12,500) are the second and third most expensive items owned by urban mills. Rural mills spent an average of MMK 2.8-3 million ($2100-2250) on these items, likely reflecting differences in size and specifications.

Very little milling equipment was purchased using credit. For urban mills, the main source of capital used to buy milling equipment was income from other non-farm enterprises (57% of purchases), or income from the milling business itself (27%). Among rural mills, income from agriculture is the main source of capital for investments in milling businesses (68%). Few businesses reported investing income from remittances or inheritance in milling. No purchases of milling equipment by rural mills and only 3% of those by urban mills were funded using credit, among which

[3] US$ 1 = MMK 1350

2% in the form of bank loans and 1% from informal sources. No equipment was obtained on a hire-purchase basis (Table 5). These findings underscore the lack of formal and informal credit suited to the investment needs of small and medium enterprises (SMEs). They also underline the complementarity of pursuing a portfolio of economic activities that enable income diversification and cross-investment between different enterprises.

Table 5: Source of capital used to purchase milling equipment

	Income/ savings from other business	Income/ savings from milling business	Income/ savings from agriculture	Hire purchase agreement with bank	Hire purchase from machine supplier	Loan from bank	Loan from informal lender	Remi-tance	Inheri-tance	Sale of assets	Other
Urban	57	27	3	0	0	2	1	0	4	4	1
Rural	6	9	68	0	0	0	0	5	2	10	0

Few mills own large vehicles. Only 3% of rural mills own any type of vehicle other than a motorbike, and none own trucks. Forty percent of urban mills own a vehicle other than a motorcycle, including 21% that own 4-wheel trucks. Very few own 6- or 12-wheel trucks. The remainder own small vehicles such as tuk-tuks and trawlerji. These findings may suggest that raw materials and processed oil are delivered to and from mills in relatively small quantities. They may also indicate that it is common for suppliers and buyers to provide their own transport, or that mills make use of vehicle rental services when necessary. Vehicles owned by mills were overwhelmingly purchased using income from oil milling or other non-farm enterprises.

3.4 Procurement and processing

In this section of the paper we analyze the behavior of oil mills, in terms of their procurement of inputs and their processing activities. Where relevant, we compare results by year (2017 and 2012), and by the type of oilseed.

Groundnut is the most important crop processed by Dry Zone millers. Groundnut is milled by 94% and 87% of urban and rural mills, respectively. Sesame is of lesser importance for urban mills (milled by 31%), but is a major crop for rural mills (milled by 74%). Larger urban mills are more likely to mill sesame than small ones (60% in tercile 3, versus 11% in tercile 1). Several other oilseeds, including sunflower, niger, and cottonseed, are milled in the Dry Zone, but in small quantities compared to groundnut and sesame. Sunflower is the most important of these; milled by 34% of rural mills, and 6% of urban mills (Table 6). For this reason, our analysis in this report focusses on exclusively on groundnut and sesame

Table 6: Share of oil mills milling crop, by location and size tercile (%)

Crop	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)	Rural
Groundnut	96	89	100	94	87
Sesame	11	25	60	31	74
Sunflower	0	11	9	6	34

Differences in the ways urban and rural mills procure inputs reflect different business models. Urban mills earn income mainly by adding value to oilseeds that they have purchased by processing them, whereas rural mills earn income mainly by providing custom milling services to oilseed farmers for a fee. Only a small percentage of urban and rural mills (9% in both cases) obtain groundnut by buying direct from farmers (Table 7). The vast majority of urban millers source groundnut from traders (94%), as compared to just 9% of rural mills. In contrast, the vast majority of rural mills (94%) offer custom milling services to farmers (for which they charge a fee), whereas just 11% of urban mills operate in this way. A little more than one third (36%) of rural mills process groundnut that they have cultivated themselves, as compared to only 3% of urban mills (Table 7).

Table 7: Share of mills procuring groundnut by source, mill location and size tercile, 2017 (%)

Source	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)	All (rural)
Farmer	7	16	11	9	9
Trader	91	99	89	94	9
Thresher	2	9	9	7	6
Custom milling for farmer	26	16	4	11	94
Custom milling for trader	0	2	2	2	0
From own production	15	0	2	3	36
Other	0	0	0	0	6

The behavior of the smallest urban mills is somewhat like that of rural mills. Urban tercile 1 mills are more likely than those in tercile 2 or 3 to process groundnut on a custom milling basis or to mill oilseeds originating from their own production. These procurement patterns have changed little since 2012. Procurement of sesame follows a similar pattern to procurement of groundnut.

Mills do not provide credit to their suppliers. With one exception, in 2017, none of the mills surveyed reported providing advances to groundnut or sesame farmers, or oilseed traders.

Most urban mills operate year round. Ninety-one percent of urban mills reported procuring groundnut in all 12 months of the year. The share of urban mills buying oilseeds in all 12 months fell slightly from 2012 to 2017: down from 94% to 89% for groundnut and 91% to 71% for sesame. Only 24% of urban mills and 12% of rural mills reported having a 'high season', and just 7% (12%) reported having a 'low season'. Procurement of sesame followed a similar pattern. In contrast, just 36% of rural mills operated in all 12 months, running for an average of 7 months. Higher proportions of rural mills report having a high season (42%) and low season (33%). This is consistent with their custom milling business model, in which most milling for farmers takes place in the months following harvest.

Large mills procure the vast majority of oilseeds used in milling. Tercile 3 mills accounted for 91% of the groundnut and 89% of the sesame procured by urban mills in 2017, while mills in tercile 1 accounted for just 1% of each crop (Table 8). The mean quantity of groundnut procured annually by urban tercile 3 mills in 2017 (599 t) was 60 times greater than the volume procured by mills in

tercile 1 (10 t). A similar pattern was found among urban mills that procured sesame (tercile 3 mills bought 63 times more sesame on average than those in tercile 1).

The domestic mill sector only utilizes a small share of Myanmar's total oilseed production. Surveyed urban oil mills reported procuring a total 7853 t of sesame in 2017 was (Table 8)[4]. An unknown quantity of sesame seed is consumed in Myanmar as food, but this amount is unlikely to be greater than the quantity milled. In contrast, Myanmar exported 132,298 t of sesame in 2017, of which 76% was received by China (Comtrade, 2019). Black sesame made up for 58% of the sesame traded by Dry Zone traders in 2017 (Belton and Mather, 2018). Black sesame is rarely milled for oil in Myanmar due to its high price, so most of this is likely exported. Ei (2013) reports data collected from the Pulses, Beans and Sesame seed Merchants Association in Muse (the location for land-based trade between Myanmar and China), showing that white and black sesame were exported in roughly equal quantities in 2012. These pieces of information are not sufficient to support an accurate estimate of how much sesame is produced in Myanmar, but together they allow for two inferences to be drawn. First, the vast majority of Myanmar's sesame – perhaps as much as 80-90% – is exported. Second, official statistics putting Myanmar's sesame production at around three quarters of a million tons (FAO, 2019) are grossly inflated - maybe by as much as five times – suggesting that Myanmar may be the tenth largest sesame producer in the world, rather than the second largest, as currently reported.

Table 8: Mean annual purchase of groundnut and sesame, by urban mills, 2012 and 2017

Item	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)
	Peanut			
Total annual purchase, 2017 (t)	440	2,477	28,448	31,365
Mean annual purchase, 2012 (t)	21	251	1256	509
Mean annual purchase, 2017 (t)	10	52	599	230
Difference in mean annual purchase, 2017-2012 (%)	-53	-79	-52	-55
Share of purchase, 2012 (%)	1	16	82	100
Share of purchase, 2017 (%)	1	8	91	100
	Sesame			
Total annual purchase, 2017 (t)	88	791	6,973	7,853
Mean annual purchase, 2012 (t)	21	243	1026	386
Mean annual purchase, 2017 (t)	7	50	441	182
Difference in mean annual purchase, 2017-2012 (%)	-67	-79	-57	-53
Share of purchase, 2012 (%)	2	26	72	100
Share of purchase, 2017 (%)	1	10	89	100

[4] Based on an average yield of 115 kg/acre and a median cropped area of sesame of 3 acres (reported in Mather et al., 2018), approximately 22,700 farm households growing sesame on 68,000 acres would be sufficient to produce this quantity of sesame.

Myanmar's total production of groundnut is likely several times less than officially reported. Myanmar's groundnut exports in 2017 stood at 101,000 t, of which 65% were to China (Comtrade, 2019). The quantity exported was three times higher than the 31,365 t utilized for oil production by Dry Zone mills in our sample. Even after factoring in groundnut shell-weight, and accounting for all groundnut milled outside the Dry Zone, reserved as seed, and consumed in grain form, it is very unlikely that Myanmar's production of groundnut reached 1.6 million t, as reported by FAO (2019).

The quantity of oilseeds procured by urban mills fell by more than half from 2012 to 2017. There was a dramatic decline in the mean volumes of groundnut and sesame procured by urban mills of all sizes. The mean volume of groundnut procured fell 55%, from 509 t to 230 t, while the mean volume of sesame procured fell 53%, from 386 t to 182 t. The reduction in median procurement volumes was even more extreme, down 68% and 76% for groundnut and sesame, respectively. The largest average reduction in volumes procured was felt by mid-sized mills (tercile 2), down 79% for both groundnut and sesame (Table 8). This finding underlines the existence of a crisis in the Dry Zone edible oil mill sector, especially when the significant drop in numbers of urban of expeller mills that took place over this period is considered.

Market concentration has intensified since 2012. The Gini coefficient is an indicator of inequality. A score of 1 signifies total inequality, while a score of 0 indicates total equality. The Gini coefficient of the volume of oilseeds procured annually by urban milling enterprises was quite high in 2012 (0.63). By 2017 this figure had risen to 0.76, indicating deepening inequality (Table 9). This implies that larger mills have been able to secure a growing share of a shrinking overall pie, even as the overall volume of oilseeds processed by mills of all sizes has fallen. As noted above, mid-size urban mills seem to have lost market share more quickly than small mills.

Table 9: Gini coefficient of volume of oilseeds procured (all urban mills), 2012 and 2017.

Year	Peanut	Sesame	All
2012	0.64	0.60	0.63
2017	0.75	0.72	0.76

Large mills source oilseeds more cheaply than small mills. For example, urban mills in tercile 3 paid 5% (MMK 100/viss[5], or $0.12/kg) less per unit for unshelled groundnut than urban mills in tercile 1 (Table 10). This difference probably reflects economies of scale (e.g. lower transport costs, lower price per unit raw material) obtained by procuring large volumes of inputs. Prices paid by mills to procure sesame are slightly higher than groundnut on average (8%), but follow a similar pattern with respect to mill size, with larger mills paying slightly less per unit. The cost advantage that larger mills enjoy in procuring inputs may contribute to the pattern of concentration noted above.

Table 10: Purchase price of shell-off groundnut for urban mills, by size tercile (2017)

Item	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)
Median price (MMK/viss)	2100	2075	2000	2050

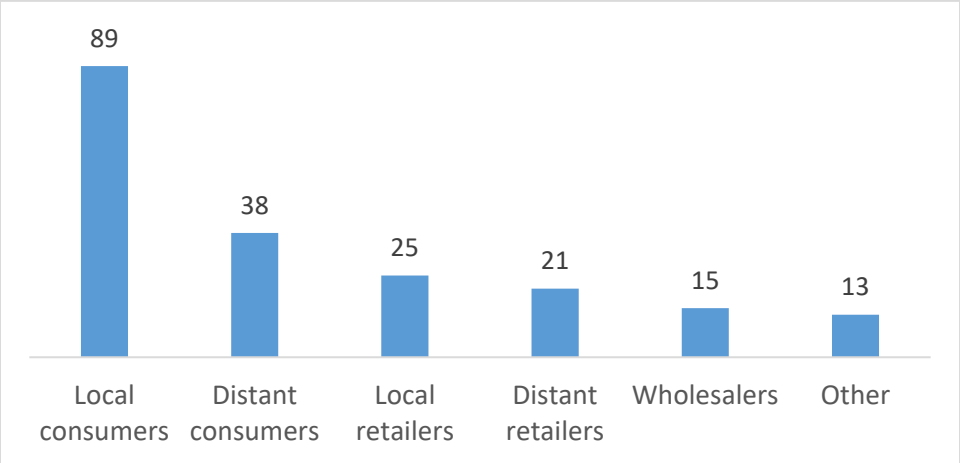
[5] 1 viss = 1.63 kg

3.5 Sales of oil and oilcake

This section analyzes the disposal of processed product (edible oil and oil cake) by oil mills, including the practice of buying and blending palm oil.

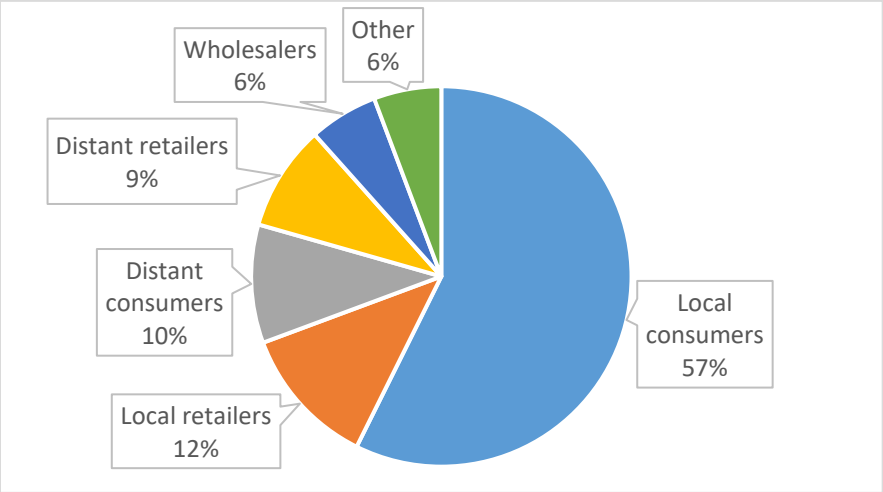
Consumers are the main market for urban mills. The vast majority of urban mills (89%) reported selling oil directly to local consumers. Even where mills do not report operating a separate retailing business, it is common for them to sell to customers at the site of the mill itself. Non-local consumers, mainly from other parts of the Dry Zone and Yangon, are the second most common type of customer (served by 38% of mills). Scoping interviews indicated that mills receive orders from non-local retail customers by phone or social media, and delivery is often made by intercity bus. Retailers are the next most important category of customer. One quarter of mills sell to local retailers, and a further 21% sell to distant retailers. Only 15% of mills sell oil to wholesale traders (Figure 5). The predominance of consumers and retailers among mill customers suggests that most business is in the form of relatively low-volume transactions. Most oil produced by rural mills is retained by custom milling customers, with most of the remainder (70%) sold to local consumers.

Figure 5: Share of urban mills selling groundnut oil to buyers, by type of buyer (%).



Most of the oil produced in the Dry Zone is consumed locally. Sixty-nine percent of all oil produced by urban mills in the Dry Zone was sold into local markets. Local consumers accounted for 57% of the sales of groundnut oil made by urban mills. Local retailers were the second largest market, accounting for 12% of sales. Of the remainder, roughly equal shares were sold to distant consumers and distant retailers (10% and 9%, respectively). Thus direct sales to consumers amounted to 67% of total production, while sales to retailers amounted to 21%. Sales of oil to wholesale traders amounted to only 6% of total sales (Figure 6). Sales of sesame oil followed a similar pattern.

Figure 6. Urban mill's groundnut oil sales, by type of buyer, 2017 (%)



Oilcake is an important co-product that contributes to mill income. One viss of shell-off groundnut yields an average of 0.41 viss of oil and 0.52 viss of oilcake. Yields for sesame are 0.44 viss of oil to 0.50 viss of oilcake. These yields vary little by mill size, or location (rural or urban). Larger mills obtain a higher average price for groundnut oilcake than small mills (Table 11). This result may reflect better handling practices in larger mills, resulting in better quality product, but may also reflect the capacity of larger mills to store cake until prices rise (Favre & Myint, 2009). A rough calculation indicates that oilcake sales account for around 20% of gross revenues from milling for urban mills.

Table 11: Sales price and production of groundnut oilcake, by mill location and size tercile (2017)

	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)	All (rural)
Mean price (MMK/viss)	896	970	1016	962	862

Oilcake is an important input for fish and livestock farming. Oilcake traders account for the largest share of oilcake disposed of by mills (32%), followed by direct sales to fish and livestock farms (26%) and animal feed manufacturers (15%)(Table 12). Oilcake traders sell to large fish/livestock farms and feed manufacturers. Most of these enterprises are located in the peri-urban zone surrounding Yangon. Most of the oilcake produced by rural mills is retained by custom milling customers as feed for their own cattle or backyard poultry (65%), retained by rural millers for the same purpose (10%), or sold to local fish/livestock farms (12%).

Table 12: Share of groundnut oilcake disposed, by mill location and type of recipient (%).

Oilcake recipient	Urban mills	Rural mills
Traders	32	5
Fish/livestock farms	26	12
Feed manufacturers	15	0
Local retailers	10	5
Local households	5	4
Retained as own animal feed	3	10
Retained by custom milling customers	1	65
Other sale	7	6

3.6 Palm oil

One third of urban mills report buying palm oil. Medium and large mills were twice as likely to report buying palm oil as those in tercile 1 (Table 13). This likely because there are high number of *sone hsi* mills in tercile 1, which actively differentiate themselves from expeller mills by selling a product that consumers identify as unblended.

Processed palm oil is cheaper than un-milled groundnut. Urban mills pay an average of MMK 2050/viss paid for un-milled groundnut, as compared to MMK 1763/viss for palm oil (Table 13). This makes it impossible for groundnut and other edible oils produced in Myanmar to compete with palm oil on the basis of price.

Table 13: Share of mills buying palm oil (%), quantity purchased, and buying price, 2017

Item	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)	All (rural)
Mills buying palm oil in past 12 months (%)	19	41	38	32	11
Mean quantity purchased (liters/month)	1900	4600	9400	5800	360
Mean buying price (MMK/viss)	1585	1814	1769	1763	1900

Mills that buy palm oil do so in large quantities. Among the third of urban mills that report buying palm oil, the average quantity purchased per month is 5800 liters (Table 13). This is higher than the 4112 liters of groundnut oil sold each month by urban mills on average (Table 14).

Medium and large mills have responded to demand for cheap oil by selling blended oils. The mean volume of groundnut oil sold per month by urban mills was 34% higher in 2017 than in 2012 (4112 t versus 3076 t) (Table 14). Large mills, which account for the vast majority of total production reported a 35% increase in average monthly sales over this period, whereas medium sized mills reported a slight drop (-12%) and small mills reported a large drop (-58%). However, as shown in Table 8, purchases of groundnut by urban mills in all terciles fell by more than half over the same period. This observation suggests that large and, to a lesser extent, medium sized mills have adapted to demand for cheaper oil by selling blended groundnut and palm oil in increasing quantities. During scoping interviews, millers reported that blended oil is sometimes produced to meet customer

specifications, and priced according to the ratio to groundnut to palm oil requested, but it seems likely that not all blended oils are marketed as such.

Table 14: Reported average monthly sales of groundnut and sesame oil in 2012 and 2017

	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)
	Groundnut oil			
Mean liters sold/month in 2012	1848	4585	4908	3076
Mean liters sold/month in 2017	776	4015	6610	4112
Change, 2012-2017 (liters)	-1073	-571	1702	1037
Change, 2012-2017 (%)	-58	-12	35	34
	Sesame oil			
Mean liters sold/month in 2012	1824	6130	7959	4042
Mean liters sold/month in 2017	644	2958	2262	2126
Change, 2012-2017 (liters)	-1180	-3172	-5697	-1916
Change, 2012-2017 (%)	-65	-52	-72	-47

Sesame oil is rarely sold in blended form. Average monthly sales of sesame oil declined sharply for mills of all sizes between 2012 and 2017; a drop of between -52% and -72%. These figures are close to percentage declines in the quantity of sesame procured by urban mills over the same period, as reported in Table 8. This suggests that sesame oil is rarely blended with palm oil, perhaps because its distinctive color and aroma make it difficult to do so.

Palm oil accounted for an estimated 15% of the volume of oil sold by Dry Zone mills. Based on the reported quantity of oilseed and palm oil procured, we estimate that palm oil accounted for 15% of the 20.9 million liters of oil sold by surveyed mills in the Dry Zone in 2017. This share was as high as 46% among mills in tercile 1 (Table 15). Given that some mills may have been reluctant to report the practice of blending oil, these figures may underestimate the prevalence of the practice.

Table 15: Inferred sales and of groundnut, sesame and palm oil (quantity and share)

	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)
Groundnut oil (million liters)	0.2	1.1	12.3	13.6
Sesame oil (million liters)	0.1	0.4	3.7	4.2
Palm oil (million liters)	0.2	1.0	1.9	3.2
Total oil (million liters)	0.4	2.5	17.9	20.9
Groundnut (% of oil sales)	43	43	69	65
Sesame (% of oil sales)	11	17	21	20
Palm oil (% of oil sales)	46	40	11	15

3.7 Marketing

More than half of urban mills brand the oil that they sell. Fifty-nine percent of urban mills sell unblended groundnut oil in branded packaging. Forty-two percent of mills sell unblended oil in containers that customers provide themselves, saving the customer the cost of packaging, and just over one quarter sell unblended oil in unbranded packaging of their own. Large mills are more likely than small and medium mills to brand unblended oil (71% in tercile 3, vs 43% in tercile 1). Blended oil is more frequently sold in unbranded containers than branded ones (50% of mills versus 39%) (Table 16). Most mills that brand their oil began to do so between 1999 and 2009. No mills reported beginning to brand after this date. This suggests that branding was an early adaptive response to increasing competition from imported palm oil by state owned enterprises that began in the early 1990s.

Table 16: Share of urban mills selling pure and mixed groundnut oil, by type of container used and branding.

Container	Pure groundnut oil				Blended groundnut oil			
	Tercile 1	Tercile 2	Tercile 3	All (urban)	Tercile 1	Tercile 2	Tercile 3	All (urban)
Branded container from mill	43	55	71	59	17	40	43	39
Container from customer	58	51	27	42	83	40	43	47
Unbranded container from mill	24	32	26	27	50	60	43	50

One third of urban mills advertise their products. Large mills are more likely to advertise than small mills (53% of mills in tercile 3, versus 15% in tercile 1) (Table 17). The most common form of advertising was 'other' (reported by 59% of those who advertised). Follow up phone calls made to mills after the completion of the survey indicated that in most cases 'other advertising' referred to placing listings in business directories or, in fewer cases, advertising in a newspaper. Facebook was the second most common advertising medium, and was particularly popular with small mills in tercile 1 (used by 43% of those who advertised). Posters and flyers were deployed by 23% and 14% of mills that advertised, respectively, perhaps reflecting the local nature of most sales.

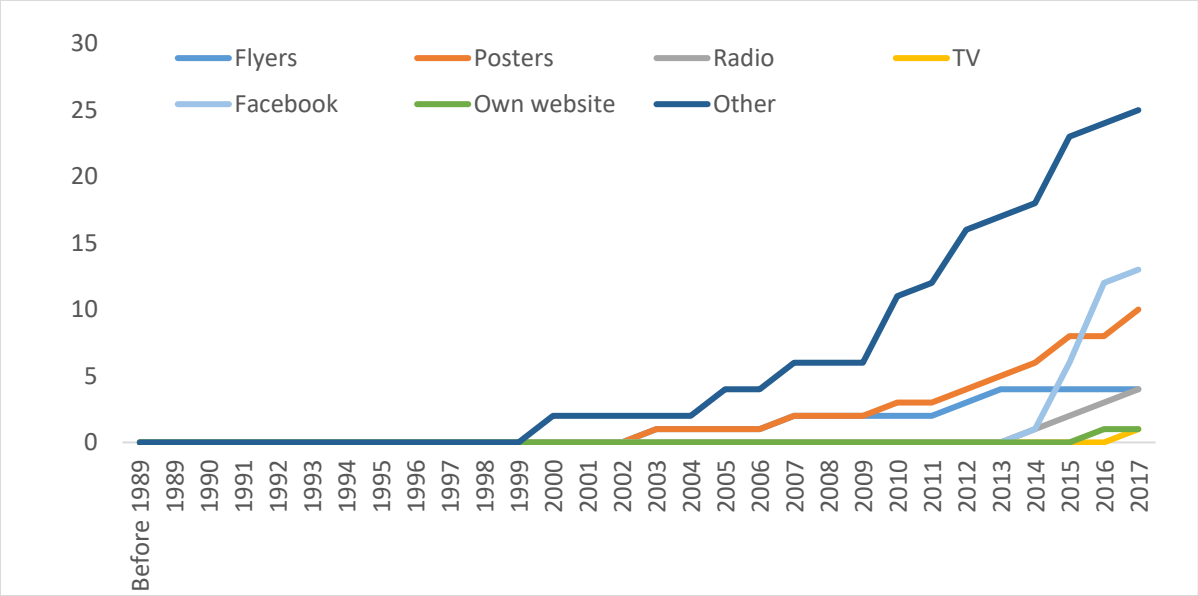
Table 17: Advertising media used by urban oil mills, by size tercile (%)

Type of advertising	Tercile 1 (urban)	Tercile 2 (urban)	Tercile 3 (urban)	All (urban)
'Other'≠	43	54	67	59
Facebook≠	43	15	33	30
Posters≠	0	31	25	23
Flyers≠	0	8	21	14
Radio≠	14	8	8	9
Own website≠	0	8	4	5
TV≠	14	0	0	2
Any form of advertising	15	30	53	32

NOTE: ≠Share of mills that used any form of advertising media

The number of mills that advertise has grown rapidly since 2011. Prior to this time, only a few mills advertised, mainly through trade directories, posters, or flyers. The number of mills advertising and the variety of advertising media deployed has increased markedly since this time, with Facebook the fastest growing medium (Figure 7). This development likely reflects both the availability of new advertising opportunities (e.g. as a result of the rise of mobile internet and relaxation of restrictions on print media), and a heightened need to attract customers in the face of falling demand for domestically produced edible oil.

Figure 7: Cumulative number of businesses initiating advertising, by medium and year.



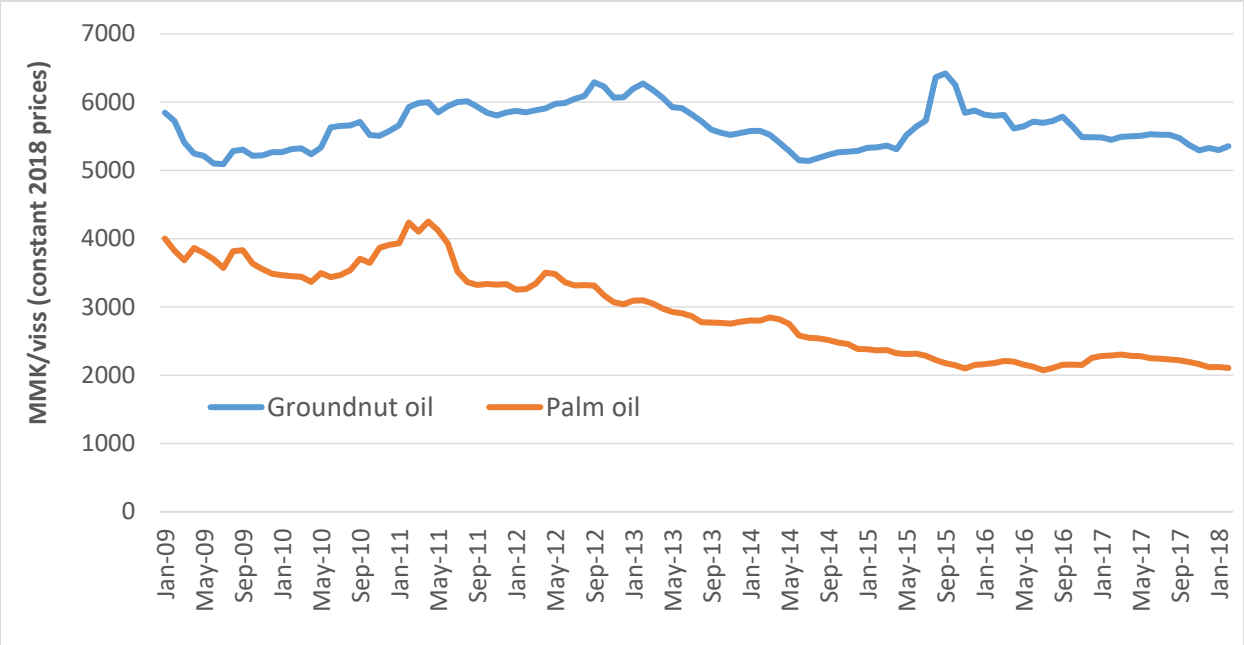
3.8 Groundnut and palm oil prices

The real retail price of palm oil has roughly halved since 2011, while the price of groundnut oil has remained stable. Figure 8 plots the real retail price of groundnut and palm oil in Myanmar over the period January 2009 to February 2018, at constant 2018 prices. Throughout this period the real price of groundnut oil has remained stable within the range of approximately MMK 5000-6000/viss. In contrast, the real price of palm oil trended steadily downward for most of this period, from roughly MMK 4000/viss, to MMK 2000/viss. The timing of this long run price decline corresponds with the liberalization of palm oil imports in April 2011. Prior to this time oil palm import licenses were allocated exclusively to a small number of state owned enterprises. Policy changes in 2011 opened up the market to private importers.

Domestically milled oil cannot compete directly with imported palm oil on a price basis. The price of one viss of un-milled groundnut is almost the same as the retail price of one viss of palm oil (around MMK 2000), and groundnut oil produced by expeller mills sells for more than double the price of palm oil. Furthermore, according to oil millers interviewed during scoping research, the quality of palm oil has improved since the liberalization of import restrictions, further enhancing its appeal to consumers. Prior to this time, it was common for palm oil to become cloudy or solidify during

periods of cooler weather, leading to periods of peak demand for domestically produced oil during the winter months, but this seasonal advantage has since diminished.

Figure 8: Real monthly retail prices of groundnut and palm oil, Myanmar, January 2009 – February 2018 (Source: calculated using data from CSO, multiple years).



Myanmar's market for edible oil has become segmented. Retail prices for domestic groundnut oil and imported palm oil have diverged to such an extent that they likely now cater to two different pools of consumers: a better-off group who can afford domestically produced oil, and a larger lower income group who cannot. When labelled as such, blended groundnut-palm oil allows demand for cheaper oil with some of the sensory characteristics of groundnut oil to be met. However, our scoping interviews revealed a widely held perception among consumers and millers that blended oil is often not marketed as such, and the belief that adulteration has undermined consumer confidence in the quality of edible oil.

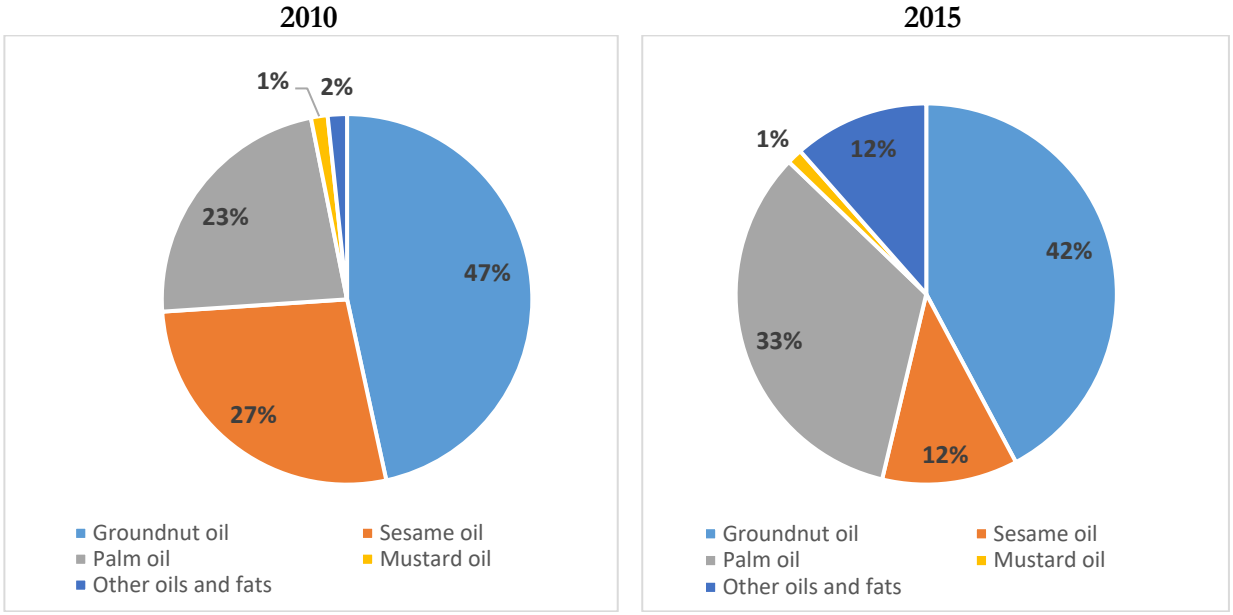
Better-off consumers are willing to pay a premium for niche high quality oil. Lack of confidence in the provenance of oil from the expeller mill sector has created opportunities for production of a 'niche' artisanal oil with distinct sensory characteristics that act as a form of quality assurance. Oil from *sone hsi* mills attracts a price premium of 11-13% over oil from expeller mills. The median price of groundnut oil produced by *sone hsi* mills is MMK 5000-5100/viss (varying by season), as compared to MMK 4500/viss from expeller mills. This premium accounts for the growth of the urban *sone hsi* mill sub-sector.

3.9 Edible oil consumption

Edible oil consumption increased sharply between 2010 and 2015. Comparison of data from the nationally representative IHLCA 2010 and MLPCS 2015 household surveys indicates that annual consumption per capita of edible oils grew by 29% over this period, from 8.72 kg to 11.25 kg.

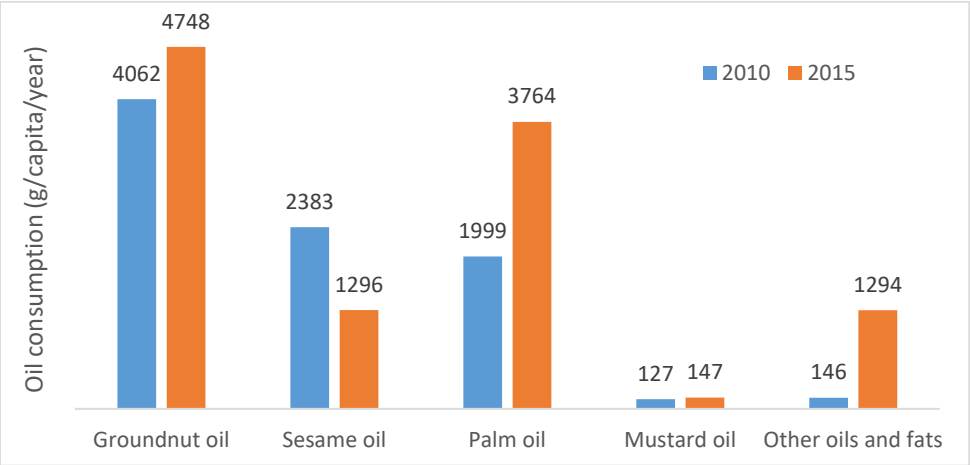
The composition of edible oils consumed changed significantly. The share of sesame oil in total oil consumption dropped from 27% to 12% and the share of groundnut oil fell from 47% to 42%. The share of palm oil jumped from 23% to 33%. 'Other fats and oils' likely comprised mainly of imported vegetable oils (e.g. sunflower, soy, rice bran) grew very rapidly, from 2% to 12% (Figure 9).

Figure 9: Composition of Myanmar edible oil consumption, 2010 and 2015 (Source: derived from datasets of IHLCA 2010 & MLPCS 2015)



Consumption of sesame oil fell, while consumption of palm oil and 'other fats and oils' jumped sharply. Consistent with results from the mill survey reported above, average annual consumption of sesame oil fell by 46%, from 2.38 kg/capita to 1.30 kg/capita. Palm oil consumption almost doubled, up 88%, from 2.00 kg/capita to 3.76kg/capita. Consumption of other fats and oils also jumped, up by 784%, but from a very low base: from 0.15kg/capita to 1.29kg/capita. The most likely explanation for this result is an increase in imports of vegetable oils other than palm oil (Figure 10).

Figure 10: Myanmar edible oil consumption, 2010 and 2015 (Source: derived from datasets of IHLCA 2010 & MLPCS 2015)

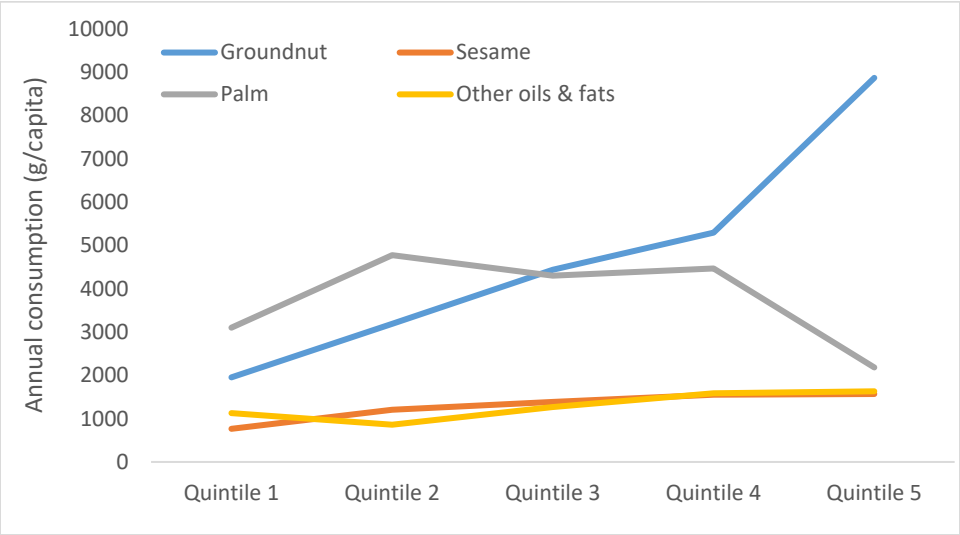


Consumption of groundnut oil increased. Reported groundnut oil consumption rose by 17% from 4.06kg/capita to 4.75kg/capita (Figure 10). This result is surprising given results presented above that show domestic milling capacity and procurement of groundnut shrunk significantly during the period 2010 to 2010. A possible explanation is that reported consumption of groundnut oil included consumption of groundnut oil blended with palm oil. This interpretation appears consistent with our oil mill survey results that show groundnut oil sales by mills did not fall, despite big reductions in the volume of raw material procured.

Palm oil is the main edible oil eaten by low-income consumers. In Figure 11, consumers are divided into five quintiles, with quintile 1 representing the 20% of the population with the lowest consumption expenditure and quintile 5 the 20% with the highest. Consumption expenditure is interpreted as a proxy for household income. Palm oil accounted for 43% and 47% of the oil consumed by individuals in expenditure quintiles 1 and 2, respectively, but only 15% of the oil consumed by those in expenditure quintile 5. Individuals in expenditure quintile 5 consumed 30% less palm oil (2.18kg/capita) than those in quintile 1 (3.1kg/capita), and 54% less than those in quintile 2 (4.78kg/capita), indicating that palm oil is an inferior good (i.e. consumption falls as income rises). These results underline the importance of palm oil for lower income consumers and the broadly positive effects of import liberalization from a consumer perspective.

High-income consumers consume much more groundnut oil than those in lower income brackets. Individuals in expenditure quintile 5 consume 354% more groundnut oil on average than those in quintile 1 (8.87kg/capita, versus 1.95 kg/capita) (Figure 11). Groundnut oil accounts for 62% of the oil consumed by individuals in quintile 5, as opposed to only 27% of the oil consumed by those in quintile 1. This suggests that interventions aimed at reducing the cost of domestically produced groundnut oil would be unlikely to convey substantial benefits to low-income consumers. Interventions that aim to increase the quality and value of groundnut oil will therefore be more appropriate.

Figure 11: Myanmar edible oil consumption 2015, by expenditure quintile. (Source: derived from datasets of IHLCA 2010 & MLPCS 2015)



4 CONCLUSIONS

The results presented above paint a picture of Myanmar's edible oil milling industry attempting to adjust to the long-term challenge posed by liberalization of edible oil imports. This shock has resulted in major restructuring within the oil mill sector. One third of urban mills have closed, and production of groundnut and sesame oil by remaining mills has fallen by around half on average. Surviving mills have sought to adapt by pursuing a range of strategies that include selling cheaper blended groundnut oil mixed with palm oil, doing more direct marketing to consumers, branding and advertising their products, and - in the case of *sone hsi* mills – "reinventing" a traditional form of oil as a differentiated premium product. This final strategy is perhaps the most successful of all, allowing small urban artisanal mills to flourish at the same time as conventional 'expeller' mills have been closing.

Collectively, this evidence points to further improvements that might be possible within the sector, and suggests a number of implications for policy and programming.

Efforts to protect Myanmar's edible oil milling industry (e.g. by restricting palm oil imports or raising import duties) would hurt poorer consumers. Although liberalization of palm oil imports has proven challenging for domestic millers, it enables consumers to access edible oil at affordable prices.

Establishing a national quality assurance scheme for edible oil could give customers more confidence in the quality and provenance of the oil they buy. However, costs of compliance should not represent a barrier to SMEs, and training and support would be needed to help to mills to upgrade practices to meet the standard.

Support for improving branding and marketing strategies could help mills differentiate their products and target a larger customer base. For example, by developing more effective online marketing campaigns and integration with emerging e-commerce platforms, or adopting geographical indications or regional brands (e.g. for Pakkoku *sone hsi* oil).

Adoption of national standards combined with better marketing can provide a foundation for entry into export markets with higher quality standards for the best performing mills, enabling more of the value added from the oilseed sector to be retained in Myanmar. Infrastructure such as laboratory testing facilities will be needed if Myanmar is to climb the value ladder.

Productivity increases in Dry Zone oilseed farming will increase farm incomes but are unlikely to improve the competitiveness of the milling sector compared to imported palm oil. Any oilseed surplus to domestic requirements is exported, dampening any effect that an increase in oilseed production by farms in Myanmar might have on domestic oil prices.

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